Consumer and Corporate Affairs Canada | Consommation et Corporations Canada

(11) (A) No. 1 219 764

(45) ISSUED 870331

(52) CLASS 99-41

(51) INT. CL.[4] A23L 2/38, A23G 1/00

(19) (CA) **CANADIAN PATENT** (12)

# (54) Non-Dairy Chocolate Drink Formulation and Process

(72) Ho, Guan-Huei;
Choy, Maria S.,
Canada

(73) Granted to Imperial Biotechniques Incorporated
Canada

(21) APPLICATION No. 473,626

(22) FILED 850205

No. OF CLAIMS 16 - NO DRAWING

Canada

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CCA-274 (11-82)

4,752,606

# NON-DAIRY CHOCOLATE DRINK FORMULATION AND PROCESS


## ABSTRACT OF THE DISCLOSURE

A non-dairy chocolate drink is disclosed which comprises a pre-mix which is later dispersed into or admixed with water, depending on whether the pre-mix is dry or liquid -- which is a function of whether dry or liquid protein has been used. In any event, the non-dairy chocolate drink is made using a protein which may be egg albumin (dried or frozen), whey protein concentrate, soy protein isolate, or combinations thereof, together with vegetable fat, fine sugar, dutched cocoa, TCP, stabilizers such as hydrocolloidal gums or carageenan, and emulsifiers. Preferably, especially with a dry pre-mix, a solid fat such as coffee blend which is fat, fine sugar and emulsifier, is used. The non-dairy chocolate drink may be pasteurized, then homogenized and stored; or it may be sterilized, homogenized and stored.


PAT 6284

FIELD OF THE INVENTION

This invention relates to the formulation and manufacture of non-dairy chocolate drinks; and relates to the manufacture and processing of such drinks which may be prepared for storage either by being pasteurized at relatively high temperatures or sterilized at much higher temperatures.

BACKGROUND OF THE INVENTION

Chocolate beverages have always enjoyed a reasonable market share, and such share is now increasing. However, chocolate milk -- that is, chocolate beverage which is based on cow's milk which has a suspension of sugar, cocoa powder and hydrocolloid as stabilizer -- is subject to very stringent regulations as to production and handling, and it is sensitive to the manner of handling. In general, milk-based beverages have only a relatively short shelf life; and the relationship of various components within the beverage, and the ability for the cocoa to remain in suspension in milk, presents an on-going problem. As well, it seems that the greatest acceptance is of milk that contains 2% milk fat -- as opposed to skimmed milk -- and it has been noted that increasing the milk fat content above 2% does not necessarily increase consumer acceptance.

In a study of chocolate beverages, we have noted particularly that high quality cocoa powder which is rich and strong in flavour, and which has good colour, must be used. However, that notwithstanding, the handling of chocolate milk requires delicate and critical operations, to preclude separation of a fat phase from a liquid phase if the chocolate milk is allowed to stand at room temperature, for example, and of course

to preserve the quality of the product and to preclude deterioration thereof. A limited amount of sedimentation may be acceptable, even though chocolate milk that has noticeable sedimentation may in fact be a richer product. Stabilizers are found to be useful, but they do not overcome the difficulties of handling and storing milk.

Because of the increasing consumer demand for chocolate beverages, and the difficulty in providing chocolate beverages that are milk-based -- even using so-called sterilized milk -- the present invention provides the market with a non-dairy chocolate drink which is a beverage that is otherwise substantially indistinguishable from high quality chocolate milk. The particular purpose, however, is to provide a formulation for a dry pre-mix (or a liquid pre-mix which otherwise has the same ingredients except water, in the same proportions) which may then be dispersed into or admixed to water to provide an acceptable chocolate beverage. Like all liquid food products, however, the problems of processing, distribution and storage must be considered, because of the possible deterioration of the product over time, and because of the possible bacterial content of the beverage. We have provided a formulation and process for making a non-dairy chocolate drink which may be processed by HTST (High Temperature Short Time) processes, by which the beverage is pasteurized so as to kill approximately 99% or more of the bacterial content of the beverage, but following which the beverage must be kept refrigerated; or the beverage may be prepared by UHTST (Ultra High Temperature Short Time) processes, by which the beverage is essentially sterilized so as to kill 100% of the bacterial content, after which it may be stored

substantially at room temperature without the need for refrigeration until it is opened. Of course, UHTST processing carries with it the understanding and requirement that the process and packaging into which the processed beverage is placed, are aseptic.

In providing a non-dairy chocolate drink, however, it is necessary to ensure that the beverage has acceptable characteristics of storability, thickness of taste and texture, good flavour and sweetness, stability, and viscosity, which substantially duplicate those of milk. Thus, the choice of constituents to essentially duplicate the fat and protein constituents that would have been found in milk, is important. Especially, the protein constituent must be carefully chosen, because such constituent may materially affect the flavour and other characteristics of the product.

At the same time, it is desired that the beverage should be prepared as inexpensively as possible, so as to be able to enter the marketplace at prices which are considerably more attractive than milk or dairy products. This suggests, on the one hand, that vegetable-based proteins should be used from such sources as soy, corn, pea or rapeseed; but in general such protein sources do not meet the requirement of being bland or flat in flavour. However, we have noted, surprisingly, that egg albumin -- either dried or frozen -- is a very effective protein source that meets all the requirements that are generally set forth to establish the acceptability of a chocolate beverage. We have, however, noticed that a beverage which contains egg albumin may not be stirred for too long or too vigorously during the process of manufacture, because of the tendency of the product to

foam.

Other sources of fat and protein ingredients for beverages may include certain palm, coconut and other vegetable oils; as well as whey or soy protein. [In most countries except Canada, although whey comes as a by-product of the manufacturer of cheese, it is not in itself considered to be a dairy product.]

One other factor that is relevant is the use of a stabilizier; and that requires that the protein reactivity of the stabilizer to the protein source must be acceptable. Thus, we have discovered that the choice of stabilizers should go to such as a hydrocolloidal gum such as Xanthan or Guar, or locust bean gums or cellulose gums; but more particularly, to carageenan which comprises mainly kappa-carageenan but may also contain alpha-carageenan, lambda-carageenan or beta-carageenan. [Carageenan is composed of both 3,6-anhydro-d-galactose and sulfate d-galactose residues, which are linked 1-4 to form long chain polymers with a molecular weight of greater than 100,000 and up to 500,000.] Most commercial carageenans are available as stable sodium, potassium or calcium salts, or mixtures of them, and are particularly helpful as stabilizers in non-dairy chocolate beverages.

A typical imitation chocolate milk may have a composition as follows:

| | |
|---|---|
| Coconut oil and/or palm oil | 2.500 parts |
| Sodium caseinate | 2.000 parts |
| Sucrose | 6.000 parts |
| Corn syrup solids, 42 DE | 2.000 parts |
| Cocoa (10/12) powder | 1.500 parts |
| Carrageenan | 0.045 parts |

| | |
|---|---|
| Mono & Di-glycerides | 0.300 parts |
| Na HPO (as buffer) | 0.200 parts |
| Salt and flavours | 0.200 parts (or as desired) |
| Water | 85.300 parts |

However, while an imitation chocolate milk such as set forth above has a quality and stability which are substantially similar to chocolate milk, it is expensive to manufacture and difficult to handle. There is therefore the requirement to provide such drink using alternate protein sources, as mentioned above.

We have determined that non-dairy chocolate beverages may be prepared using either HTST or UHTST processes, and depending on the protein source they may be homogenized either at pressure or no pressure, as discussed hereafter. In general, the processes that are followed are these:

HIGH TEMPERATURE SHORT TIME PROCESS

The beverage which comprises a dispersion of a dry pre-mix into water or an admixture of a liquid pre-mix with water is, in any event, heated to a temperature of 60 to 75 degrees celcius, and it is then held at that temperature for 3 to 5 minutes. Thereafter, the mixture is further heated for pasteurization to a temperature of 77 to 85 degrees celcius, and it is held at that temperature for about 20 to 30 seconds so as to be pasteurized. Following pasteurization, the beverage is cooled to about 73 to 77 degrees at which temperature it is homogenized; and thereafter the pasteurized and homogenized beverage is cooled to below 10 degrees celcius for storage.

-TRA HIGH TEMPERATURE SHORT TIME PROCESS

In carrying out this process, as with the high temperature process above, the pre-mix and water mixture is first heated to 60 to 75 degrees celsius at which it is held for 3 to 5 minutes. However, thereafter, the mixture is heated to 142 to 145 degrees celcius, for sterilization, and it is held at that elevated temperature for about 3 to 10 seconds. As in the other process, the beverage is then cooled to about 73 to 77 degrees celcius for homogenization, and thereafter the sterilized and homogenized beverage may be cooled to below 25 degrees celcius for storage.

Of course, it is important that the processes be carried out under rigid conditions of hygiene; and it is especially important in the UHTST process that the sterilization, homogenization and packaging steps be carried out under aseptic conditions, and that the packages be aseptic, so that the sealed packages into which the sterilized non-dairy beverage has been placed may then be stored at room temperature (below 25 degrees celcius) for periods of up to 6 months or more.

There now follows some general examples of various non-dairy chocolate drink beverages that have been prepared, with observations as to their acceptability. One of the constituents that is referred to as a constituent in a number of the examples is "coffee blend, 50% V.F. (vegetable fat)", which is treated essentially as a solid fat in a dry pre-mix formulation, and comprises 50% vegetable fat, about 45% fine sugar, and about 5% emulsifier, salt, flavours, etc.

EXAMPLE 1

A series of pre-mix compositions were made, each having 28.5 parts of coffee blend (50% V.F.), from 37 to 38 parts fine sugar, and 7 parts of dutched cocoa (10 to 12% fat). Whey protein concentrate, 35%, was added in 25 parts, with .08 parts salt, and with stabilizers and emulsifiers in small quantities. The pre-mix was dispersed into water in the amount of 5 parts of water to 1 part of pre-mix, and batches of the mixture were pasteurized at 80 degrees celcius for 5 minutes without blending, and were stored under refrigerated conditions. All of the batches showed good flavour, taste and texture, with no separation of the mixture following storage for five days at 4 degrees celcius.

EXAMPLE 2

Similar batches as in Example 1 were prepared, using whey protein concentrate, but the batches were blended before cooling and after pasteurization. In each case, the flavour was good, the taste was good and the texture was smooth; and the batches showed stability following storage at 4 degrees celcius after eight days.

EXAMPLE 3

Similar batches to those of Example 1 were prepared except that pea protein isolate was used, and the mix was not blended after pasteurization. While the flavour was good in all batches, some of the batches were too thick in texture; and none of the batches showed stability following storage for only 20 hours at 4 degrees celcius, in that the cocoa precipitated in each of the mixtures and the beverage separated.

EXAMPLE 4

Similar unblended batches as those in Example 3 were made, using soy protein isolate. None of the batches was acceptable in flavour, having a slight soy flavour, and the taste and texture ranged from thin but grainy to good but grainy. Moreover, the batches showed very poor stability and all had separated following storage for only two hours at 4 degrees celcius.

EXAMPLE 5

A number of batches were prepared having 24 parts of coffee blend (50% V.F.), 50 parts of fine sugar, and 7 parts of dutched cocoa (10 to 12% fat). Dried egg albumin in the proportion of 8.33 parts to 12.6 parts was added to the pre-mix composition; salt was added in the proportion of 0.56 parts, stabilizer in the range of 0.15 to 0.40 parts was added, (or up to 0.65 parts of stabilizer mix) emulsifier to some batches, and tricalcium phosphate (TCP) in the amount of 0.5 parts was added to all of the batches. In each case, the pre-mix was then dispersed into water in the ratio of 5 parts of water to 1 part of pre-mix, the mixture was pasteurized at 80 degrees celcius for 5 minutes and was then blended at high speed for 30 seconds before being cooled. The pasteurized chocolate drink was then stored at 4 degrees celcius; and in all cases showed good flavour and sweetness, but some batches were slightly thick whereas others were slightly thin, except for those to which a stabilizer mix had been added. After storage for ten hours at 4 degrees celcius, those batches to which the stabilizer mix had been added showed better stability without cocoa precipitation and/or phase separation.

EXAMPLE 6

A dry pre-mix composition of 24 parts coffeee blend (50% V.F.), 39.4 parts fine sugar, 7 parts dutched cocoa (10 to 12% vegetable fat) with 1 part salt, 0.5 parts TCP, 0.28 part stabilizer and 0.2 part emulsifier was prepared. The pre-mix composition also contained 22.5 parts whey protein concentrate (50% protein) and 5 parts of whey protein concentrate (35% protein). The pre-mix was dispersed into water in the ratio of 1 part pre-mix to 5 parts of water, heated to 75 degrees celcius and held at that temperature for 5 minutes with strong stirring. It was then heated to 142 degrees celcius and held at that temperature for 4 seconds, after which the mixture was cooled to 70 degrees celcius and homogenized at 1000 psig. A comparison of samples of the mix before and after the Ultra High Temperature treatment showed that the mix had good flavour before the high temperature treatment and a strong cooked flavour after the high temperature treatment which disappeared after two days of storage. Following four days of refrigerated storage there was a very slight cocoa precipitation, and slight separation.

EXAMPLE 7

A similar batch as in Example 6 was prepared, but in this case some of the batch was homogenized at 0 psig while another portion of the batch was homogenized at 500 psig. In both cases, following homogenization and storage for more than one day, the stability, flavour, taste and sweetness were all good, and the batches remained stable after seven days of refrigerated storage.

EXAMPLE 8

A pre-mix composition of 24 parts coffee blend (50% V.F.), 58.4 parts fine sugar, 7 parts dutched cocoa (10 to 12% fat), 0.6 part salt, and 0.63 part stabilizer mix was prepared, to which was also added 8.33 parts of egg albumin powder. Following dispertion of 1 part pre-mix to 5 parts water, the mixture was heated to 75 degrees celcius for 5 minutes with strong stirring, and was then sterilized under UHT conditions at 142 degrees celcius for 4 seconds. One portion of the beverage was then homogenized at 0 psig and 70 degrees celcius, while another portion was homogenized at 500 psig and 70 degrees celcius. All of the samples showed a bitter cooked flavour which disappeared in one day, and were stable after seven days. The samples which were homogenized at 0 psig were slightly thick, whereas those that were homogenized at 500 psig were good in all respects.

EXAMPLE 9

A similar pre-mix composition to that of Example 8, except that 10 parts of dried egg albumin powder were used, was prepared, admixed to water, and was pasteurized at 78 degrees celcius for 5 minutes with strong stirring. Again, some samples were homogenized at 0 PSIG at 70 degrees celcius, and others at 500 PSIG at 70 degrees celcius; and while all samples showed excellent stability, their taste and body was slightly thick.

Other tests were also carried out to show that when egg albumin is used, excessive stirring causes foaming, but strong stirring during pasteurization is acceptable. Moreover, still other tests as well as those above showed that homogenization for

beverages having egg albumin protein should be carried out at pressure, preferably in the range of 500 to 1500 psig; whereas those having whey protein may be homogenized at from 0 to 1500 psig.

Suitable emulsifiers include mono-diglyceride, lecithin, 2-stearoyl lactylate, the sodium or calcium salts thereof, and sucrose acetate isobutylate (SAIB) alone or in combination. All of those emulsifiers are generally commonly known.

Likewise, suitable vegetable fats may be hydrogenated or non-hydrogenated palm oil, coconut oil, palm kernel oil, peanut oil, corn oil, rapeseed oil, or olive oil, alone or in any combination. However, as with the choice of protein, it is important to choose a vegetable fat so that the pre-mix shall have a bland or flat flavour.

The choice of egg albumin source, in particular, may also include liquid or frozen egg albumin, in which case the pre-mix becomes a liquid pre-mix having the same dry component composition as any of the examples. Ordinarily commercially available dried egg albumin sources have about 80% to 95% protein constituent; and liquid or frozen egg albumin sources have about 15% to 30% protein constituent.) When a liquid pre-mix is used, then its admixture with water is generally in the range of 1.5 to 2.5 parts of water to 1 part of pre-mix, as desired and required in order to meet the standards and requirements of the marketplace. Also, if a sweetened egg albumin is used (dried or frozen) the added sugar content of the pre-mix is adjusted accordingly.

What has been shown, however, is that a non-dairy chocolate drink may be prepared, which may be pasteurized (HTST

process) or sterilized, and where the protein source may be egg albumin, with whey protein concentrate also being acceptable and soy protein isolate being acceptable except that its flavour may be objectionable in some instances. The non-dairy chocolate drinks of the present invention differ considerably from imitation chocolate milk -- which, in any event, are not available in the marketplace -- because they do not seek to imitate milk by use of sodium caseinate, corn syrup solids, sucrose and the like; and they are most acceptable as to taste, flavour, sweetness, texture and stability.

The ambit of the present invention is to found in the accompanying claims.

CLAIMS

1. A non-dairy chocolate drink comprising a pre-mix and water, in which the pre-mix has the following composition:

PRE-MIX

| | |
|---|---|
| Vegetable fat | 10-25 parts |
| Fine Sugar | 45-85 parts |
| Dutched Cocoa (10 to 12% fat) | 5-10 parts |
| Protein(s) | 5-30 parts |
| Stabilizer(s) | 0.1-2.0 parts |
| Salt | 0.2-1.2 parts |
| Emulsifier(s) | 0.01-0.1 parts |
| Tricalcium phosphate | 0-2.0 parts |
| Flavour | optional |
| Colour | optional |

wherein the pre-mix is dispersed into water in the ratio of 1 part pre-mix to 4.5 to 5.5 parts water; and is thereafter heated, held at high temperature for a short time; homogenized; and then cooled and stored;

wherein the protein is chosen from the group comprising egg albumin, whey protein concentrate, and soy protein isolate, or combinations thereof;

wherein the heating temperatures and times are as high as 75° C for up to five minutes, and then as high as 85° C for up to thirty seconds or as high as 145° C for up to ten seconds;

wherein said stabilizers are chosen from the group comprising hydrocolloidal gums, locust bean gums, cellulose gums and carageenans including kappa-carageenans, alpha-carageenans, lambda-carageenans, and beta-carageenans;

and wherein said emulsifiers are chosen from the group

comprising mono di-glycerides, lecithin, 2-stearoyl lactylate, the sodium or calcium salts thereof, and sucrose acetate isobutylate, or any combination thereof.

2. The composition of claim 1, wherein the protein is egg albumin.

3. The composition of claim 1, wherein the protein is whey protein concentrate having from 20% to 75% protein constituent.

4. The composition of claim 1, wherein the protein is a mixture of egg albumin and whey protein concentrate having from 20% to 75% protein constituent.

5. The composition of claim 1, wherein the mixture is heated to 60° to 75° C and is held at that temperature for 3 to 5 minutes, and is then heated to 77 to 85° C and is held at that temperature for about 20 to 30 seconds for pasteurization, and is then cooled to about 73 to 77° C for homogenization, and thereafter is cooled to below 10° C for storage.

6. The composition of claim 1, wherein the mixture is heated to 60 to 75° C and is held at that temperature for 3 to 5 minutes, and is then heated to 142 to 145° C and is held at that temperature for about 3 to 10 seconds for sterilization, and is then cooled to about 73 to 77° C for homogenization, and thereafter is cooled to below 25° C for storage.

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7. The composition of claim 1 wherein liquid protein(s) are used in such proportion that the dry protein(s) constituent is about 5 to 30 parts apart from the liquid portion of the liquid proteins; and where the liquid pre-mix is then later admixed with water in the ratio of 1 part liquid pre-mix to 1.5 to 2.5 parts of water.

8. The composition of claim 2 wherein the egg albumin is chosen from the group comprising dried egg albumin, frozen egg albumin, sweetened dried egg albumin and sweetened frozen egg albumin.

9. A method of preparing a non-dairy chocolate drink comprising a pre-mix and water, wherein the pre-mix has the following composition:

PRE-MIX

| | |
|---|---|
| Vegetable fat | 10-25 parts |
| Fine Sugar | 45-85 parts |
| Dutched Cocoa (10 to 12% fat) | 5-10 parts |
| Protein(s) | 5-30 parts |
| Stabilizer(s) | 0.1-2.0 parts |
| Salt | 0.2-1.2 parts |
| Emulsifier(s) | 0.01-0.1 parts |
| Tricalcium phosphate | 0-2.0 parts |
| Flavour | optional |
| Colour | optional |

comprising the steps of:

dispersing the pre-mix into water in the ratio of 1 part pre-mix to 4.5 to 5.5 parts of water;

heating the mixture;

holding the mixture at high temperature for a short time;

homogenizing the mixture;

and thereafter cooling and storing the prepared beverage;

wherein the protein concentrate, and soy protein isolate, or combinations thereof;

wherein the protein is chosen from the group comprising egg albumin, whey protein concentrate, and soy protein isolate, or combinations thereof;

wherein the heating temperatures and times are as high as 75° C for up to five minutes, and then as high as 85° C for up to thirty seconds or as high as 145° C for up to ten seconds;

wherein said stabilizers are chosen from the group comprising hydrocolloidal gums, locust bean gums, cellulose gums and carageenans including kappa-carageenans, alpha-carageenans, lambda-carageenans, and beta-carageenans;

and wherein said emulsifiers are chosen from the group comprising mono di-glycerides, lecithin, 2-stearoyl lactylate, the sodium or calcium salts thereof, and sucrose acetate isobutylate, or any combination thereof.

10. The method of claim 9, wherein the protein is egg albumin.

11. The method of claim 9, wherein the protein is whey protein concentrate having from 20% to 75% protein constituent having from 20% to 75% protein.

12. The method of claim 9, wherein the protein is a mixture of egg albumin and whey protein concentrate.

13. The method of claim 9, wherein the steps of heating, holding at high temperature for a short time, and homogenizing are the following:

heating the mixture to 60 to 75 degrees celcius;

holding the heated mixture at that temperature for 3 to 5 minutes;

then heating the mixture to 77 to 85 degrees celcius;

holding the mixture at that second temperature for about 20 to 30 seconds;

cooling the mixture to about 73 to 77 degrees celcius for homogenization;

homogenizing the mixture;

cooling the mixture to below 10 degrees celcius;

storing the cooled prepared beverage.

14. The method of claim 9, wherein the steps of heating, holding at high temperature for a short time, and homogenizing, are the following:

heating the mixture to 60 to 75 degrees celcius;

holding the heated mixture at that temperature for 3 to 5 minutes;

then heating the mixture to 142 to 145 degrees celcius;

holding the mixture at that second temperature for about 3 to 10 seconds;

cooling the mixture to about 73 to 77 degrees celcius for homogenization;

homogenizing the mixture;

cooling the mixture to below 25° C;

storing the cooled prepared beverage.

15. The method of claim 9 wherein a liquid pre-mix is prepared by using liquid protein(s) in such proportion the dry protein constituent is about of 5 to 30 parts of the pre-mix, apart from the liquid portion of the liquid protein(s);

and where the liquid pre-mix is admixed with water in the ratio of 1 part liquid pre-mix to 1.5 to 2.5 parts water.

16. The method of claim 9, wherein the step of homogenization is carried out at 500 to 1500 psig when the protein is egg albumin, and at 0 - 1500 psig when the protein is whey protein concentrate.

# SUBSTITUTE

## *REMPLACEMENT*

## SECTION is not Present

## *Cette Section est Absente*